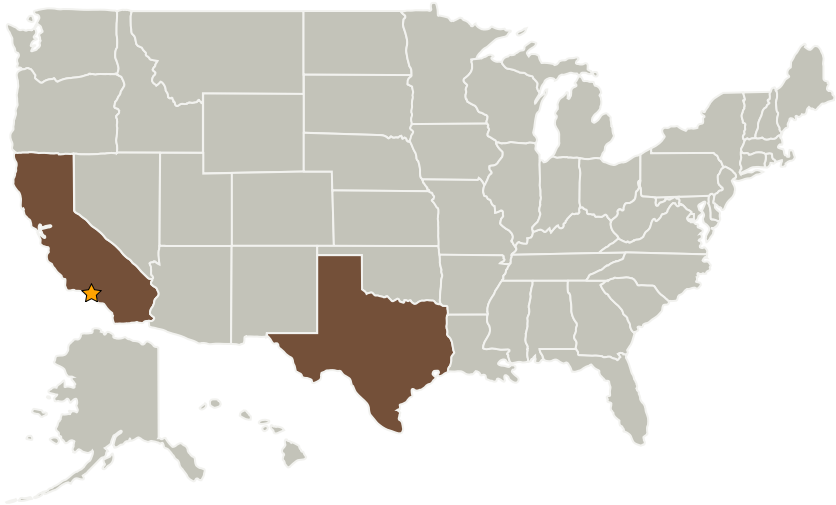
In-Situ Production of Hydrogen for Buoyancy on Titan, Phase II

Completed Technology Project (2005 - 2007)

Project Introduction

Resupply of materials in space applications is a significant logistical problem. Historically the replacement materials have been carried with the spacecraft. This problem increases dramatically as mission duration and distance from the earth increases, as in missions to Saturn or Titan. It is estimated that a buoyant vehicle operating on Titan may require 75 g of make-up hydrogen per week. This represents approximately 35 kg of additional mass at launch solely for the storage of make-up hydrogen to maintain buoyancy of the craft on Titan for a one-year mission. During the Phase I project Lynntech demonstrated that hydrogen can be generated in-situ directly from the Titan atmosphere from 100 K to 300 K with 10 watts using proprietary plasma reformation techniques, and that metal hydrides are viable hydrogen separation devices. Lynntech's low volume, low mass (~2 kg) system will save approximately 33 kg at launch (>$72M) for a one year Titan mission. Based on a conservative estimate (using Mars mission equivalency factors), Lynntech's proposed system has an advantageous equivalent system mass (ESM) after only 47 mission days. The Phase II effort will focus on further improving hydrogen production efficiency and a long-term endurance test of the system.

Primary U.S. Work Locations and Key Partners



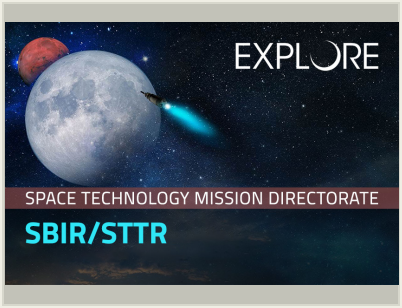


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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Lynntech, Inc.	Supporting Organization	Industry	College Station, Texas

Primary U.S. Work Locations	
California	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.2 Mission Infrastructure, Sustainability, and Supportability
    - TX07.2.1 Logistics Management